An Approach to Improve Speed and Objectivity in Audits

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Abstract. Yet at many companies today, there is still an enormous amount of inertia around implementing the tools, technologies, processes and training to meet increasingly in their business and innovation processes. This paper present and discusses a tool for Consulting, Audit company's, that made external audit or for any company that made internal audits. Our approach is intended to increase the speed of audit process and convert knowledge in capital, using mobile platforms such as PDA, TabletPC and Laptop. After testing in real world with some entities, proved that can reduce time of audit process.

Keywords: Mobile, Audit, Networking, Synchronization.

1 Introduction

The heavy competitive pressure of the market forces all competitors to design strategies of continuous adaptation to business environment, creating agile and flexible structures for responding, with the highest total quality level, to market demands. Each enterprise operates in the market as a node in the network of suppliers, customers, service providers and partners and to track them and not lose customers they need to improve their technologies and processes [1].

The main difficulty when we talk about audits is to get the same audit assessment changing auditor [2]. An auditor expert can bring capital to the enterprise and customers thrust, because he has the knowledge and experience. When an auditor expert goes way, the enterprise loses knowledge, customers and capital [2].

With the intent of answering the exposed problems, the demand is strong and because in the market the tools that exist are specialized only in one audit type [3][4][5]. The approach described in this paper had as objectives reduce audit process time, the customer must receive the final report faster and materialize the knowledge into a model. When tacit knowledge is converted into explicit knowledge with Information Systems a materialized knowledge was occurred, personal knowledge was transferred to the group or organization. The base of knowledge of auditors is the pyramid of an audit's company, and all the companies do not want to lose knowledge.

Nowadays, because the market competition is not always easy to keep an audit expert, or any kind of collaborator, and for do not lose their knowledge, this approach put the knowledge into a model (materialize the knowledge), which will be used in

the audit creation. This model must be created always by one auditor expert or a team with experience in Audits, to create a good model.

One model can be applied to several audits, contains all questions and possible answers, and depending on the answers is requested justification and the possible justification is presented. In case of negative answers it's possible to allocate clues and corrective measures to the questions (items).

Instead to do an audit with checklist in paper, the auditors work with a PDA or TabletPC. At the end of the audit, the auditor synchronize the data with the server using a wireless connection (Internet, GPRS, etc), and can send a *pdf* with audit results to customer in the moment.

Using models which materialize the knowledge, audit effectiveness will be improved, variation between different auditing experts will be reduced, and will facilitate decision making during an audit.

The paper is structured as follows: Section 2 contains current method and related work. In the section 3 describe the development environment and the system developed. Section 4 contains the results, and section 5 contains conclusions, critical analysis and future work.

2 Current Method and Related Work

Some of the companies that support us do audits, and the process that they use can be seen in Fig 1. The process is based on 3 steps. First step, the auditor take the checklist, in paper, goes to the customer and execute the audit, by checking the list (questions) and answer that question taking notes by hand. Second step, the auditor goes to their office and passes to computer the audit checklist with notes and conclusions. After the report created is sent to the customer where is described the audit strengths and weaknesses. All the process can take for 15 to 30 days at least.

Fig. 1 - Current Audit method

In the market (National and International) there is tools for this purpose [3][4][5], but they are very specific, for example, HACCP (Hazard Analysis and Critical

Control Point) audits where includes Restaurants, Butchers, Bakeries, etc. Tools ago referenced, has been tested with some of audit models by a group of auditors, some are expert other no, and the results was different in some audit topics. The different results occur because these tools allow subjective answers. To create new models, or change the structure of them it is difficult because the systems are based on one owner model structure base.

In addition, *European Foundation for quality Management*, *Malcom Baldrige* (EFQM) [8] and *Prémio da Excelência – Sistema Português da Qualidade* (PEX-SPQ) [7], that are essentials management models for a certified company. PEX-SPQ is based on EFQM that is one of the best models for:

- Self-Assessment;
- Benchmark;
- Identify areas for Improvement;
- A common Vocabulary and a way of thinking.

3 Our Approach and Development Environment

3.1 Our Approach

Our approach to the problem was been based on possibility to create large models, very complexes, very detailed and can integrate management models like EFQM. This approach does not change much the auditing process, but changes the way the audit model is created in order to achieve the audit effectiveness, reduction of the variation between different auditing experts, and facilitate decision making during an audit.

For reduction of the variation between different auditing experts and to facilitate decision making during an audit it is essential remove the subjectivity of the answers. To remove subjectivity of the answers, the questions of the model need to be very detailed, simple and objective for the answers can be at atomic level. For example, to the question: “The table has meat on top?” the possible answers will be: “Yes” or “No”. Removing subjectivity to the answers putting them at atomic level is to materialize the knowledge.

In some cases, the question does not make sense exists, for these cases coexisting, a new possible answer is added for example: “Not Applied”. The auditors usually do not use answers like: “Yes” or “No”, generally the question are at level of satisfaction so usually the answers are: “Satisfactory”, “Not Satisfactory” and “Not Applied”.

In Fig. 2 it is possible to see the process of auditing, since the auditor goes to the customer until the customer receives the final report. Similar to the older process, but instead of having a checklist (in paper), now the auditor have a mobile equipment. At the end of audit execution, the auditor can send a temporary final report (digital

format) with audit results to the customer, where the customer can see the weaknesses, strengths and corrective measures recorded. This report is carried out on pre-defined report templates for the purpose. With the temporary report the customer can make the necessary changes immediately after the audit, and not need to wait a lot of days.

The final report, despite being able to perform in mobile equipment, it is done in auditor's office for validation, certification and to make an authenticated printed version.

Fig. 2 - Audit process developed

In Fig. 3 is described which contains a model. A model contains all the questions and possible answers for each question for the audits. Depending on what answers is given, the system can ask to the user (auditor) for a justification, if during the model construction, the model constructor require a justification, it will not be possible answers without a justification.

In case of negative answers, it is possible to allocate clues and corrective measures to the questions (items). Clues have the goal of helping to find solutions to detected problems and relate problems with possible causes. The auditor as performs the audit, when find a problem can add Clues to that question and relate it with other issues or questions. A Clue can be used for advice and to call attention for a topic or issue during then audit execution.

The Corrective Measures like Clues, when a problem is found, the auditor writes a corrective measure, if is applied, in order to solve the problem, based on legal solutions or not. Corrective Measures are classified on: Non-legal compliance or legal compliance. If occurs a corrective measure classified on Legal compliance, the auditor need to add which law refers that corrective measure and some description of the law.

There is a base of knowledge (lexical database) in the system, which contains all words written in the models (questions, answers, justifications, etc), with the aim of assisting in the creation new text by completing words or phrases. This base will grow up, until the administrator so wishes, because stores phrases, and there is a lot of possible combinations of words and phrases.

Audit Framework is a Framework[1] which contains re-usable components, interfaces, code libraries used in all development layers and it was all developed for this work.

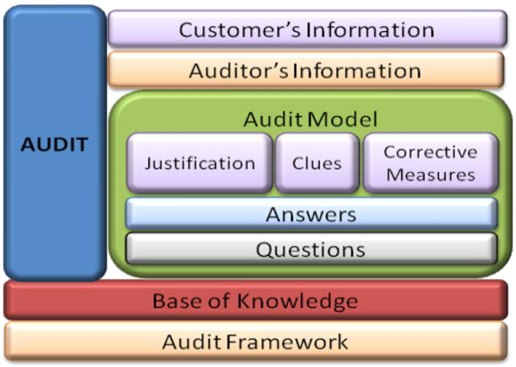

Fig. 3 - Core of Business Layer

Fig. 4 shows the overview of entire system. There is 4 ways that the user can operate the system. Eye2PDA and Eye2AuditTablet are the applications that the auditors use for auditing the customers. Eye2AuditWeb and Eye2AuditDesktop are used for audit management, to create or change models.

The Data Layer has been tested with Mysql, Oracle and Sql Server, all the companies are working with Sql Server 2000 or 2005 because already have the software.

For data synchronization between mobile equipment and the Server has created a module, part of Audit Framework, for confidentiality reasons do not will be described in this paper, which receives encrypted data from secure XML Web Service to Data Layer.

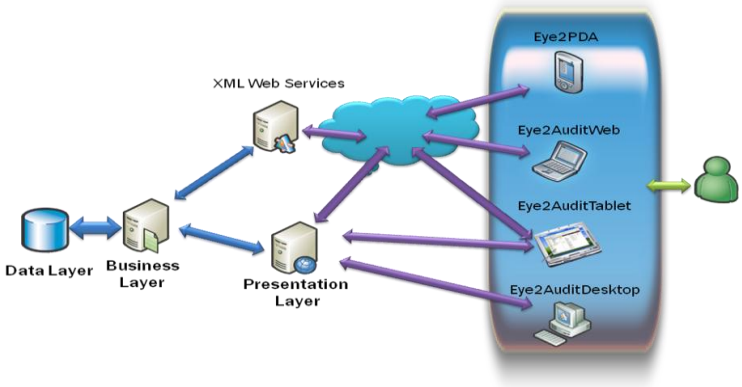

Fig. 4 - General view of the System

[1]A software framework is a re-usable design for a software system (or subsystem). May include support programs, code libraries, a scripting language, or other software to help develop and *glue together* the different components of a software project.

3.2 Development Environment

The main development tool used in this work was Microsoft Visual Studio 2005 [6], using C# language with .NET Framework 2.0. Was used .net framework because it´s a requirement of the companies, and .NET Framework offers a number of advantages like [6]:

- Consistent Programming Model;
- Direct Support for security;
- Simplified Development Efforts;
- Easy Application Deployment and Maintenance.

Was used the traditional n-tier application architecture, more information can be found on [9].

3.3 Mobile Transaction Processing

Database transaction processing conforms for several years now to the criteria of atomicity, consistency, isolation and durability (ACID). Techniques like two-phase commit (2PC) and locking (2PL) [10], in turn, are used by almost every transaction to achieve the atomicity and isolation properties and preserve the consistency of shared data. Two-phase commit protocol between the transaction manager and all the resources enlisted for a transaction ensures that either all the resource managers commit the transaction or they all abort.

Although 2PC guarantees the autonomy of the transaction, the required processing load is quite heavy, creating frequent update conflicts, especially when data is duplicated across multiple sites. Replication of data is a way to alleviate this conflict problem and is usable only when transaction-based update propagation is not required. Most distributed systems adopt these two methods in parallel to judiciously match the requirements of the application [11].

The basic Two-Phase Locking protocol is the most common locking protocol in distributed transactional systems to accomplish update synchronization and concurrency control. Often vendors combine concurrency control techniques like 2PL, consistency control techniques like 2PC, and timeout for deadlock resolution into a single implementation for global distributed transaction management [11]. With 2PL, a transaction execution consists of *two* phases. In the first phase, locks are acquired but may not be released. In the second phase, locks are released but new locks may not be acquired.

In mobile computing environments, transaction processing faces new challenges due to typical characteristics of wireless networks such as low bandwidth, frequent disconnections by mobile hosts (MH), very low processing power as well as limited storage capacity of the mobile devices.

Moreover, we adopt the assumption of [11] that handoff delays pose a severe challenge for database transactions, hence we recognize the need for a novel transaction model to counter their effects. In addition, the mobile devices that are used today operate as I/O and communication devices primarily with low processing

capabilities and battery life, while they rely on proxies working on their behalf and residing at their mobile-support station (MSS) of the current cell.

A novel model for transaction execution in such environments may not use the traditional techniques of 2PC and 2PL, as transactions would only get a small fraction of useful work done due to frequent aborts which owe to network disconnections.

An effort towards this direction defines such a model (so called Kangaroo Transactions [12]) by building upon the concepts of split and global transactions, which ensures the successful execution of transactions despite the occurrence of handoffs, a reference models layers are given in Table 1. Following this model, a number of solutions have been proposed by other authors [13][14][15] that address issues related to roaming, disconnections, data availability and transaction throughput. Kangaroo Transactions is transaction model to capture the movement behavior of transactions in a multi-database environment where mobile transactions do not originate and end at the same site.

Table 1. Reference models layers (Kangaroo Transactions)

Layer	Location	Purpose
Source System	Fixed Host Base Station Mobile Unit	Provide services defined by specific software.
Data Access Agent	Base Station	Coordinate access to data in source system and facilitate recovery. Manage mobile transaction.
Mobile Transaction	Base Station Mobile Unit	Grouping of operations needed to perform user request initiated at a mobile unit.

While combining the requirements of security and mobility, we are also concerned with other relevant issues like concurrency and performance (of an individual transaction and an entire system too).

Fig 5 shows the effect of these factors on each other within the context of a mobile transaction. The dotted arrows denote undefined effects for which different views can be presented (we keep this discussion out of the scope of this paper). Though concerned with the security of shared data during the execution of mobile transactions, we are conscious not to do this at the cost of reduced concurrency and degraded performance (a more elaborate analysis can be found in [16]).

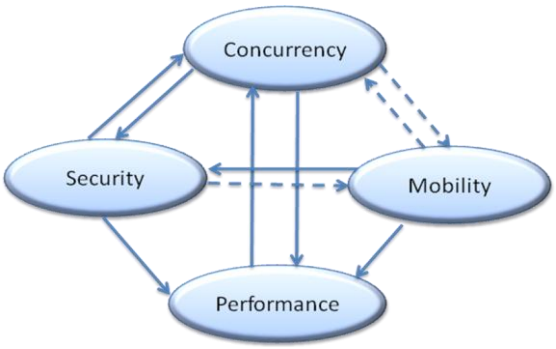

Fig. 2 - Interdependence among various factors in mobile processing

4 Experiments and Results

Experiments take place in Castelo Branco, in Aquimisa [17]. Aquimisa is a consulting company in Food Industry and is a laboratory analyses that provide services of assistance and control of quality. The work was developed in 2007 and ended in September.

After prepare the system in Aquimisa installations, which correspond to install SQL Server 2005 Database, install the application "Eye2PDA" on three PDAs (Qteck 9100), one "Eye2AuditTabletPC" on TabletPC (Asus R2HV) and one version "Eye2AuditDesktop" on Desktop PC for Audit Management and to create new models.

During the first month, 2 auditors began to perform the audits with the PDA and checklist in paper to compare with which method they were faster, to find possible problems with the application. At the beginning, they was faster to execute an audit with the checklist in paper (not prepare report) than in PDA, because they are not familiarized with PDA.

The three months later, they are already familiarized with the PDA, and they take the same time using the checklist in paper and the PDA, in this moment are 3 auditors working only with PDA. When they are auditing they need to see all items (questions), so is normal, that they having spent the same time with checklist and PDA.

Another part of the experiment was the creation of the final report to send to the client. With the Report template, the final report is automatically created, missing only introductions and conclusions, but the Strengths and weaknesses of the audit was already separated, which with the checklist in paper, they need to spend hours to separate one by one in the computer. The Report Template can create statistics based on present and old audits that belongs to the same customer, comparing the results and display corrective measures and advices to overcome the problems.

After testing in real world, was proved that can reduce audit process time like we can see in Fig. 6 (Data provided by Aquimisa), were has presented the same audit with

different process. The process using the paper checklist subtitled “Before” and with PDA subtitled “After”. An improvement has been achieved, by average, of one day and a half for half an hour.

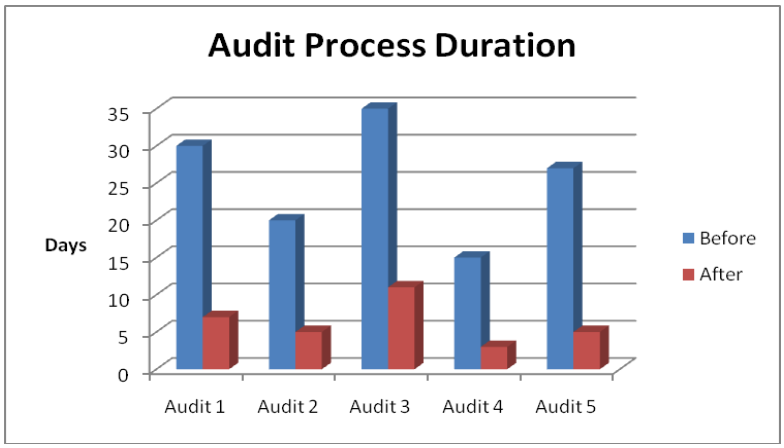

Fig. 6 - Compare Audit Executions (Aquimisa November 2007)

5 Conclusions and Future Work

5.1 Critical Analysis

Our approach was intended to increase speed to audit process and convert knowledge in capital, using mobile platforms such as PDA or TabletPC and new audit models. The speed of audit process was increased because the process to create the final report was optimized, so that at the end of the audit execution the final report was already prepared. The speed of audit execution was not increased because in checklist or in PDA have the same questions and answers, so it takes the same time.

Another objective was convert knowledge in capital. The tacit (implicit) knowledge has two dimensions: the technical and cognitive. The technical dimension concerns the practical knowledge to know execute a task. The cognitive dimension was based on schemes, mental models, beliefs and perceptions that reflect our image of reality (which is) in our vision of the future (which should be) [18]. The explicit knowledge is the knowledge formal, often encrypted in Mathematical formulas, rules, specifications, etc. It is that knowledge that can be formally expressed with the use of a system of symbols and based on objects and rules and can therefore be easily communicated or disseminated [18].

Convert the tacit knowledge to explicit knowledge, through Information Systems, we are transferring the individual knowledge to the group, to the organization. In this case we convert, transfer the tacit knowledge to an explicit knowledge and stores that knowledge into an audit model very detailed. And when we materialize the knowledge we are transforming them into a tool to be used by the organization to make profits, so we can consider that was converted knowledge into capital. If one organization loses an auditing expert, do not will lose all knowledge, because that knowledge was already materialized.

This objective is only achieved if the model created was well constructed, if the answers were at atomic level, i.e. there is atomicity in the answers, if the tacit knowledge was well converted to explicit knowledge.

An Audit with objective answers does not need a specialist Auditor, and is not sensitive to subjective answers. Consequently different auditors can obtain the same audit assessment.

5.2 Future Work

The approach presented, requires the creation of audit models very detailed, which requires time and costs. One way to recover the investment made on creating models, is get profit by selling owner audit models to other organizations.

It proposed an on-line platform (Fig 7), where companies, that have this tool, can share their audit models, not for free, but to take advantages of this tool and make profitable their audit models, their knowledge.

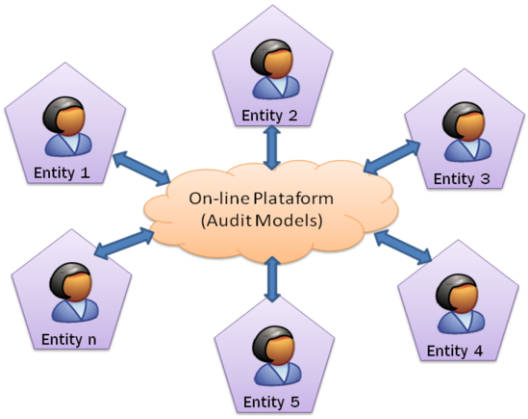

Fig. 7 - Online platform (Future Work)

With the platform it will be possible recover the investment, or part of it, when selling the models. When selling models, it is sharing audit models with other auditing experts, that they can find mistakes in the models and make improvements on them, and continuing materialize new knowledge coming from diverse organizations.

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